MP 19 (7)

Lect #2

1-24-11

8. For the function g whose graph is shown, state the following.

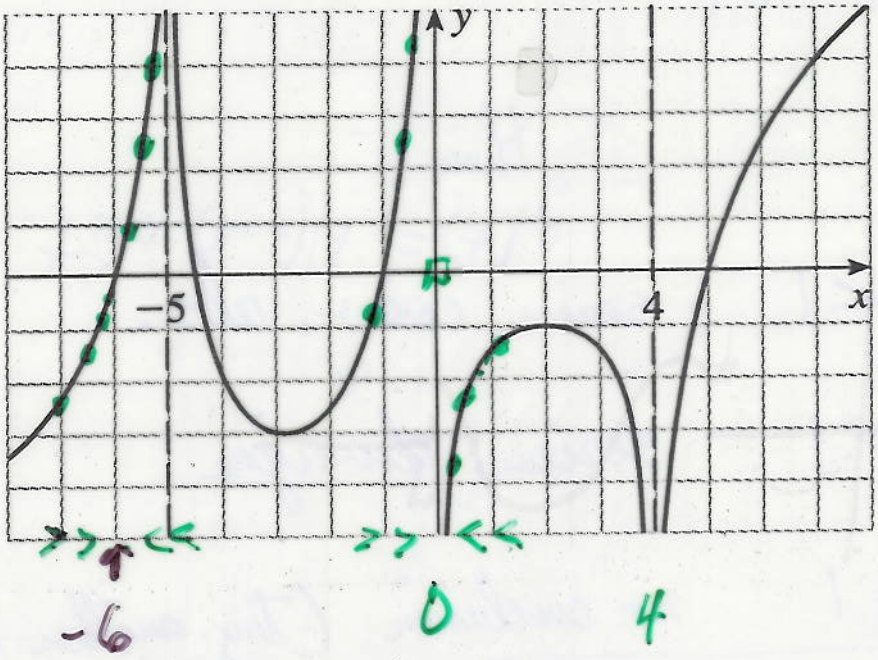
(a) $\lim_{x \to -6} g(x)$ $= 0$

(b) $\lim_{x \to 0^-} g(x)$ $= +\infty$ and $\lim$ DNE

(c) $\lim_{x \to 0^+} g(x)$ $= -\infty$ and DNE

(d) $\lim_{x \to 4} g(x)$ $= -\infty$ and DNE

(e) The equations of the vertical asymptotes. $x = -5$, $x = 0$, $x = 4$



-6

0

4

$\lim_{x \to 0} g(x)$ DNE

$\lim_{x \to 4^+} g(x) = -\infty$

$\lim_{x \to 4^-} g(x) = -\infty$

Let's show a few limits algebraically p 2

(1) $\lim_{x \to 3} \dfrac{x^2 - x - 2}{x^2 - 4} = \dfrac{4}{5}$ ($x^2 - x - 2 \to 4$, $x^2 - 4 \to 5$)

$\dfrac{0}{6} = 0$

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(2) $\lim_{x \to 2}$ ($x^2 - x - 2 \to 0$, $x^2 - 4 \to 0$)

I.F. $\dfrac{0}{0}$

$\dfrac{6}{0} \to +\infty$ or $-\infty$ both

Do algebra

$$= \lim_{x \to 2} \frac{(x-2)(x+1)}{(x-2)(x+2)} = \lim_{x \to 2} \frac{x+1}{x+2} = \frac{3}{4}$$

($x+1 \to 3$, $x+2 \to 4$)

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(3) $\lim_{t \to 0}$ $\dfrac{\sqrt{t^2+9} - 3}{t^2}$ ($\sqrt{t^2+9} - 3 \to 0$, $t^2 \to 0$)

I.F. $\dfrac{0}{0}$

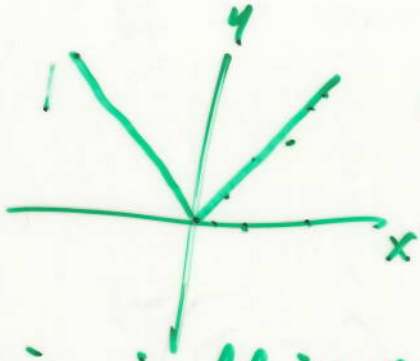
Alg Trick is to mpy num & denom by conjugate

$$= \lim_{t \to 0} \frac{\sqrt{t^2+9} - 3}{t^2} \cdot \frac{\sqrt{t^2+9} + 3}{\sqrt{t^2+9} + 3}$$

$$\lim_{t \to 0} \frac{t^2 + 9 - 9}{t^2(\sqrt{t^2+9} + 3)} = \lim_{t \to 0} \frac{1}{\sqrt{t^2+9} + 3} = \frac{1}{6}$$

(4) $\lim_{x \to 0} \frac{|x|}{x}$

$|x|$



piecewise defined fcn

$$|x| = \begin{cases} x & x \text{ is pos or } 0 \\ -x & x \text{ is neg} \end{cases}$$

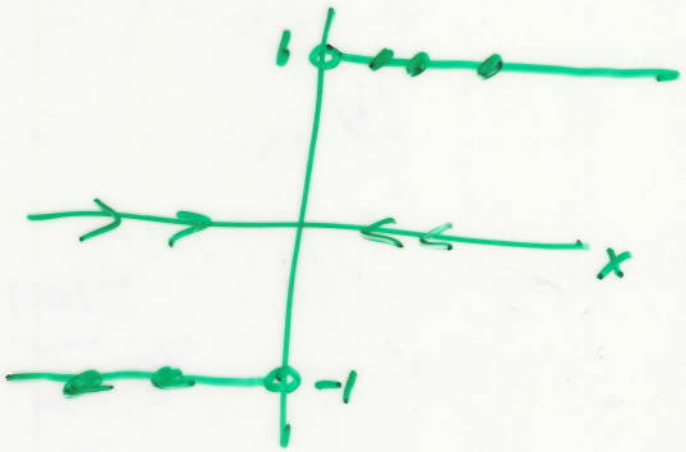
$\lim_{x \to 0^+} \frac{|x|}{x} = \lim_{x \to 0^+} \frac{x}{x} = 1$

$\lim_{x \to 0^-} \frac{|x|}{x} = \lim_{x \to 0^-} \frac{-x}{x} = -1$

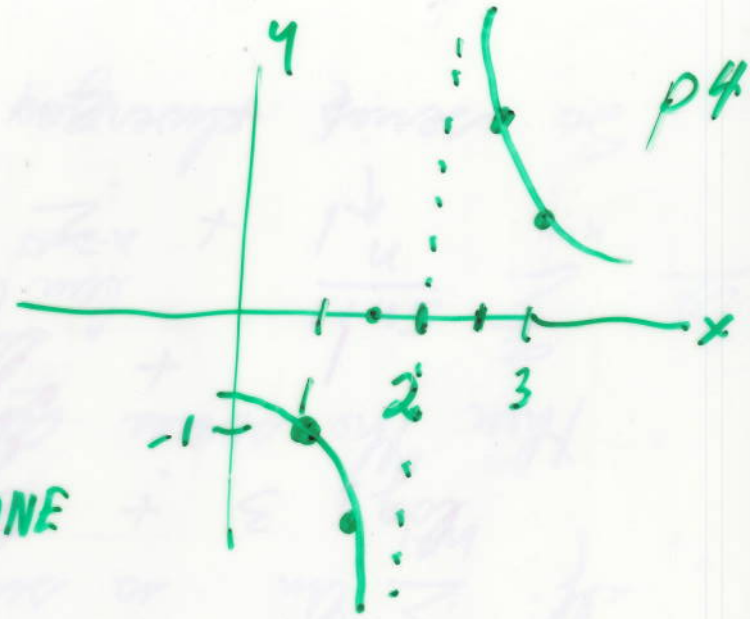
Since $1 \neq -1$

$\lim_{x \to 0} \frac{|x|}{x}$ DNE

graph of $\frac{|x|}{x}$



(5) $\lim_{x \to 2} \frac{1}{x-2}$



$\lim_{x \to 2^+} \frac{1}{x-2} = +\infty$ & DNE

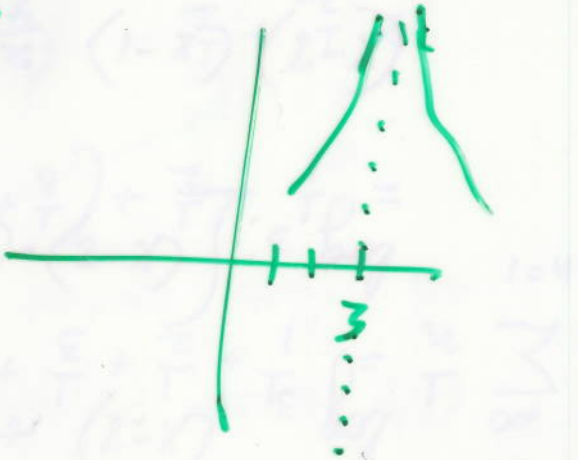
$\lim_{x \to 2^-} \frac{1}{x-2} = -\infty$ & DNE

$\lim_{x \to} \frac{1}{x-2}$ DNE

x	y
3	1
2.5	$\frac{1}{.5} = 2$
1	-1
1.5	$-\frac{1}{.5} = -2$

(6) $\lim_{x \to 3} \frac{1}{(x-3)^2} = +\infty$ & DNE

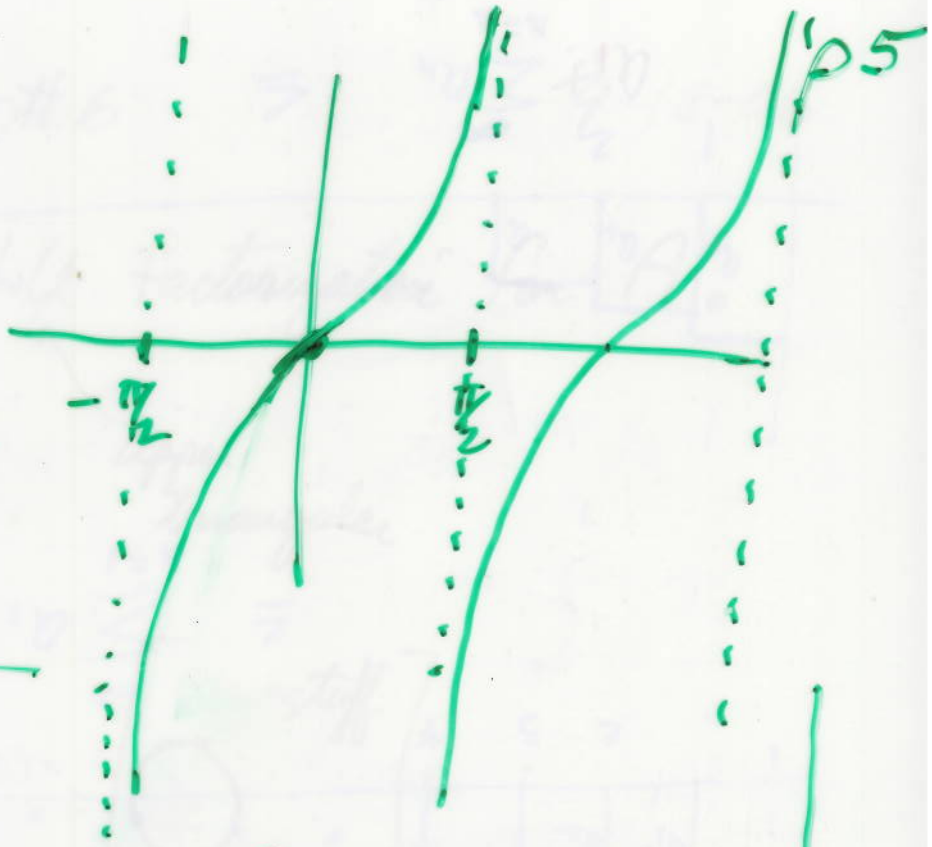
$(x-3)^2 \to 0^+$



(7) Trig

$\lim_{x \to \frac{\pi}{2}} \tan x$

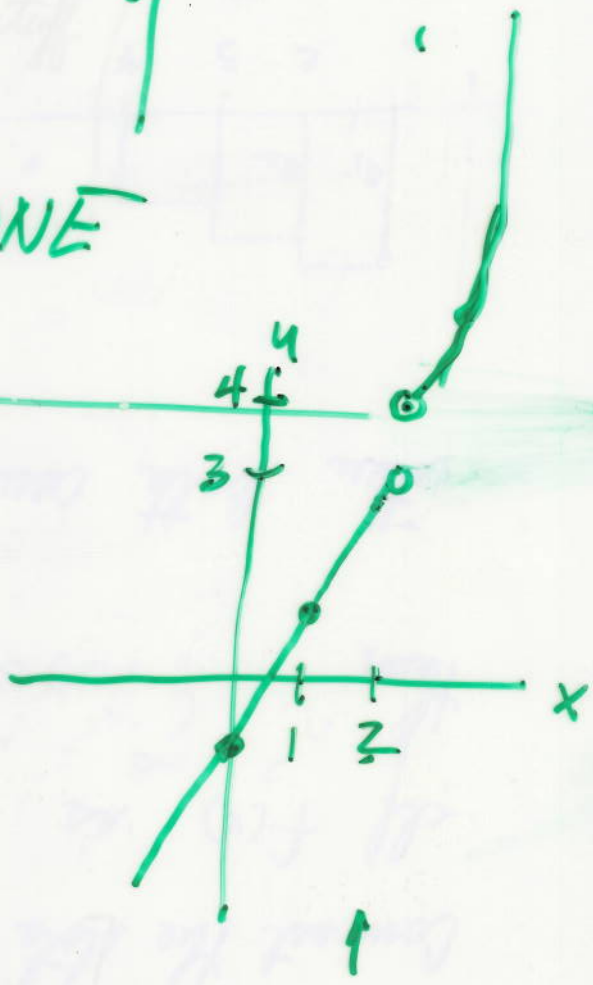
plain DNE



$\lim_{x \to \frac{\pi}{2}} (\tan x)^2 = +\infty$ x DNE

(8) Piecewise defined fun

$$f(x) = \begin{cases} 2x-1, & x < 2 \\ x^2, & x > 2 \\ 4, & x = 2 \end{cases}$$



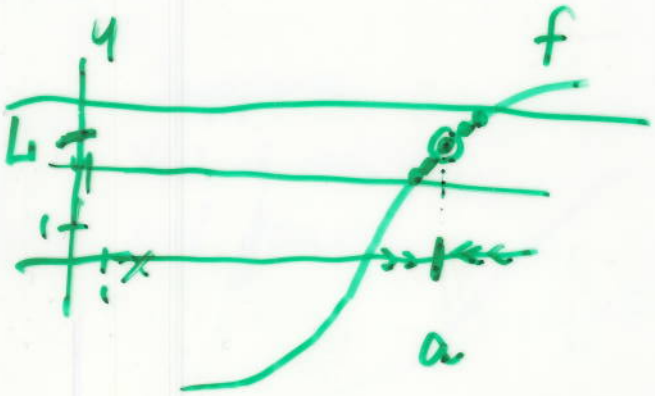
$\lim_{x \to 2} f(x)$ = DNE because

$3 \neq 4$

$\lim_{x \to 2^-} f(x) = 3$

$\lim_{x \to 2^+} f(x) = 4$

$f(2) = 4$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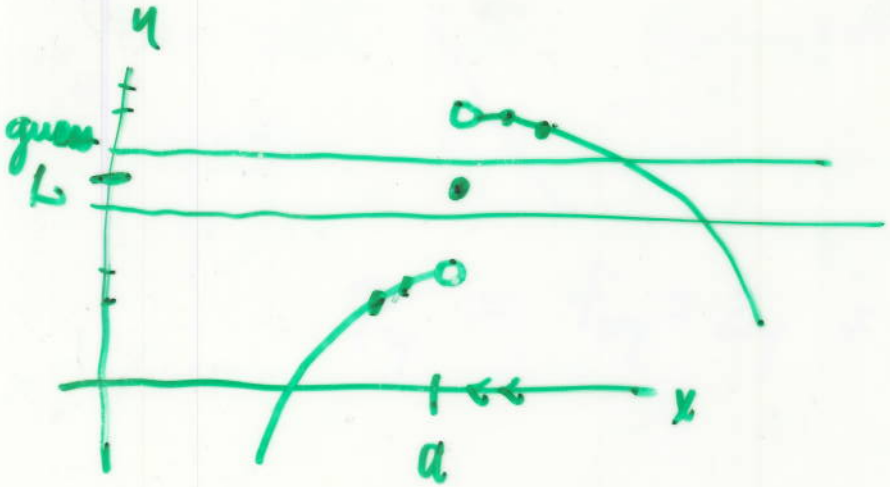
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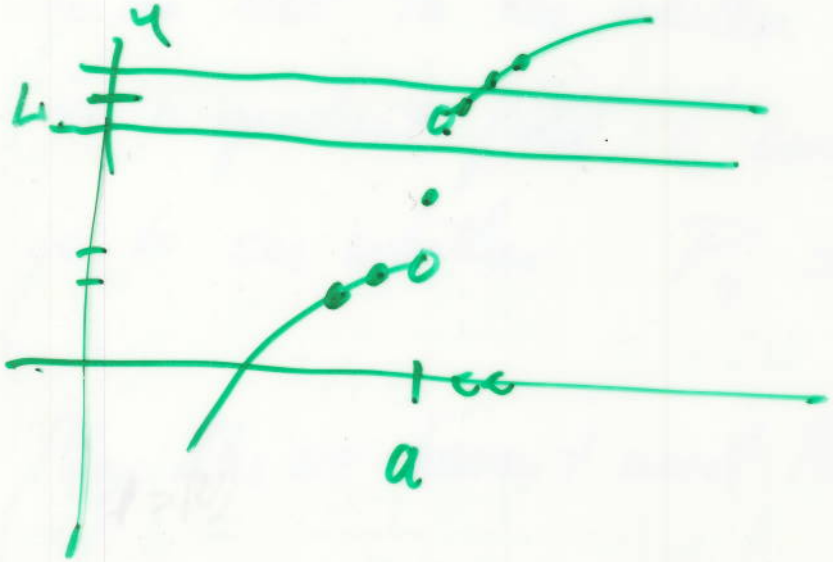
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